

## **Restorative dentistry III.**

### **5 th lecture**

- 1. Periodontal diseases related to restorative treatment**
- 2. Management of deep caries**
- 3. Preparation trauma**
- 4. Postoperative sensitivity**
- 5. Miniinvasive treatment**

# Prevention

- Gentle interrupted preparation
- Sharp instruments, well centered
- Sufficient watercooling by using highspeed rpm (50ml/min)
- The biggest preparation instruments for the excavation of carious dentin

# **Restorative dentistry III.**

## **5 th lecture**

**1. Periodontal diseases related to restorative treatment**

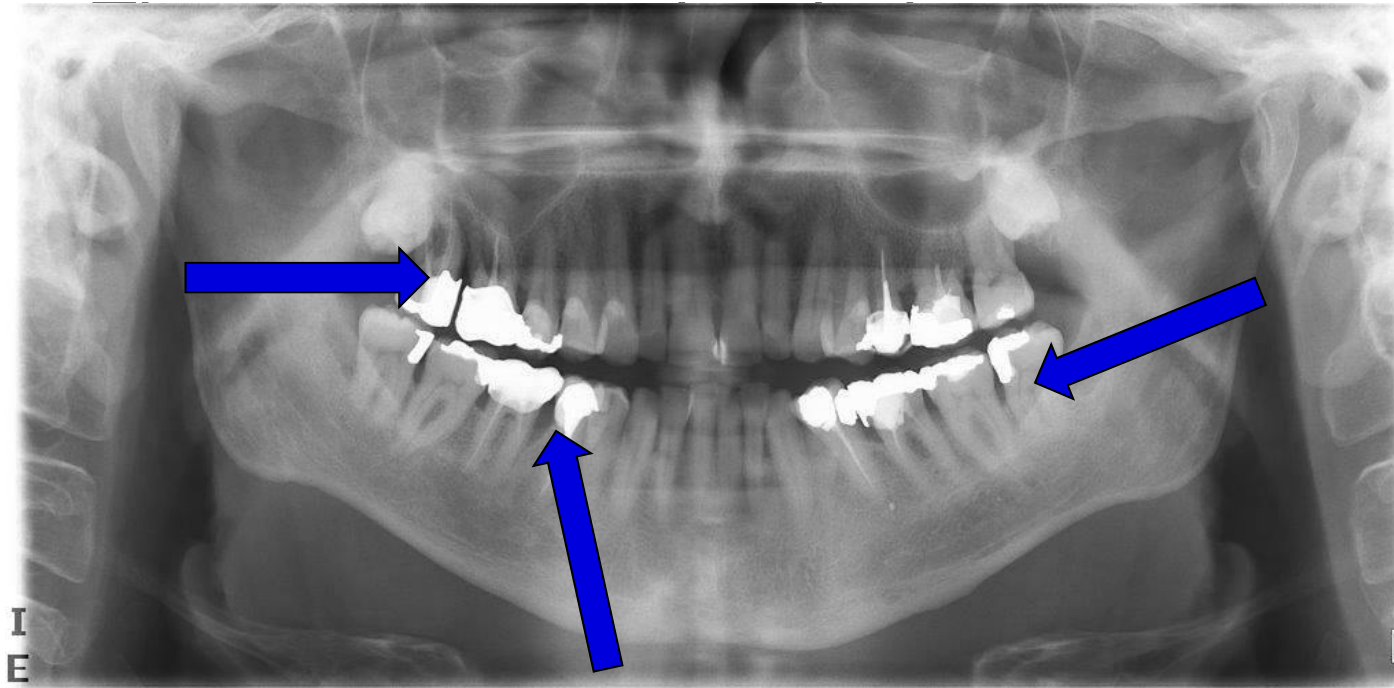
# Mistakes of making filling can cause periodontal diseases

- Reconstruction of the contact point:
- Contact point – contact area!
- The space below the contact area is a caries danger area – plaque accumulation!
- The interdental papilla is retracting during ageing – interdental oral hygiene is important!

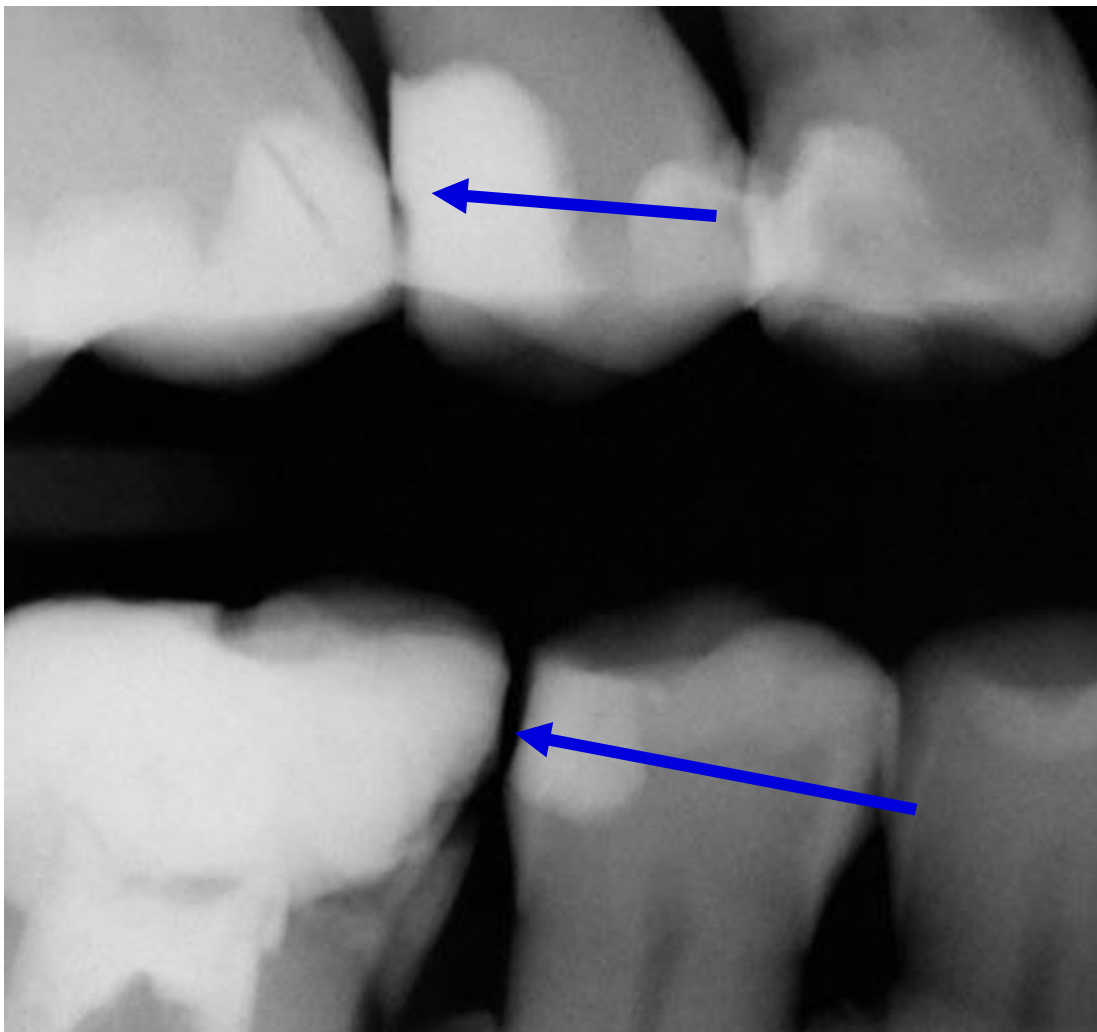
# Mistakes of making filling can cause periodontal diseases

- Reconstruction of the contact area is very important!
- Remember – by reconstruction the contact area remember that:
- Contact area is made of the filling material only. The axial walls are situated 0,5mm from the natural contact area.
- By reconstruction is important to study the contact area!

# Clinical consequences of the most common mistakes – the contact point is missing

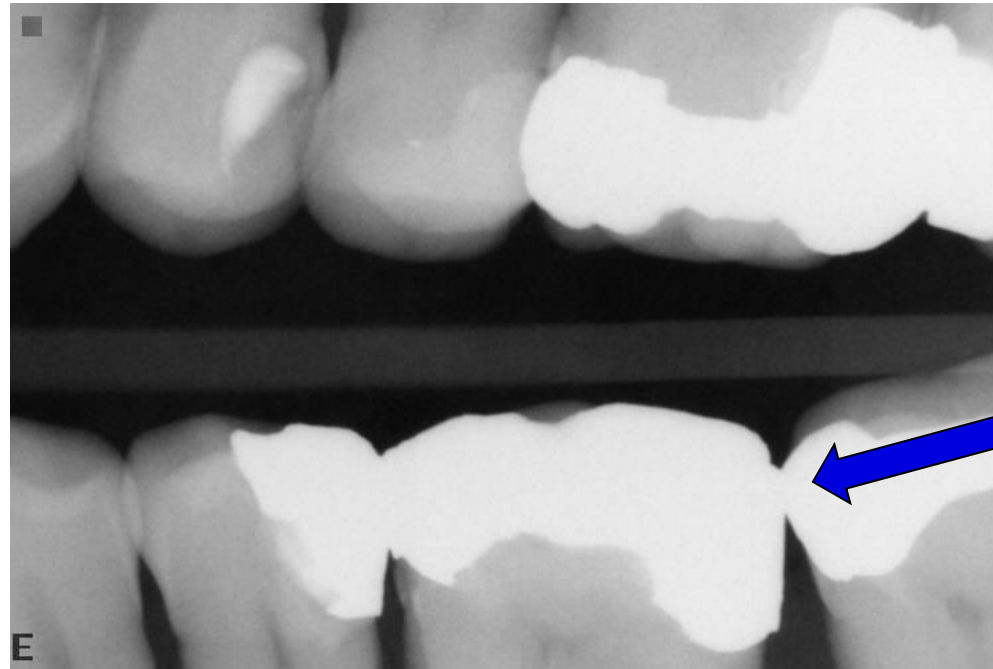


Retention of food  
Plaque accumulation  
Inflammation  
Bone resorption  
Periodontal pocket



7 Definujte zápatí – název prezentace nebo pracoviště

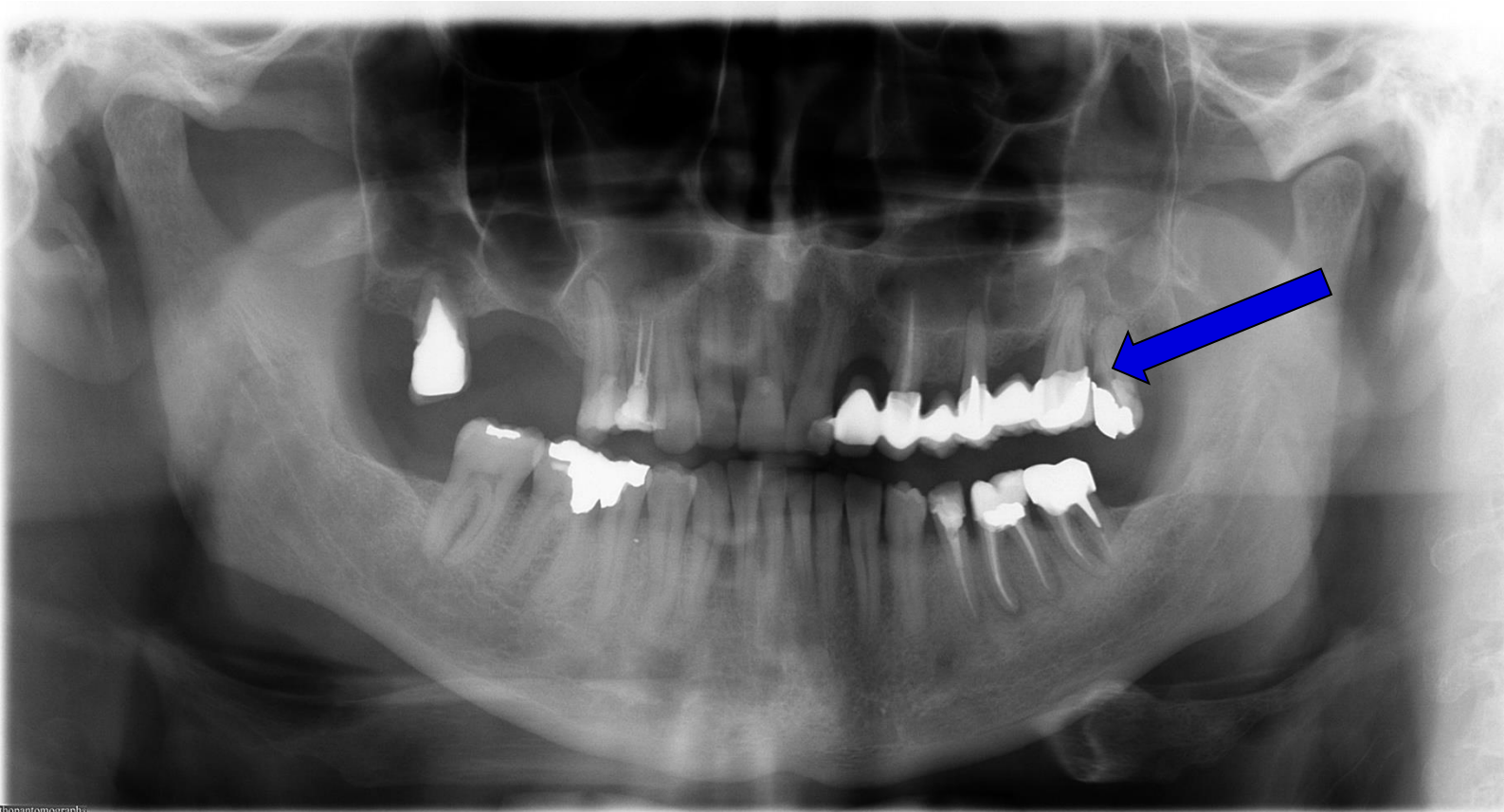
## Bad contour, overhang



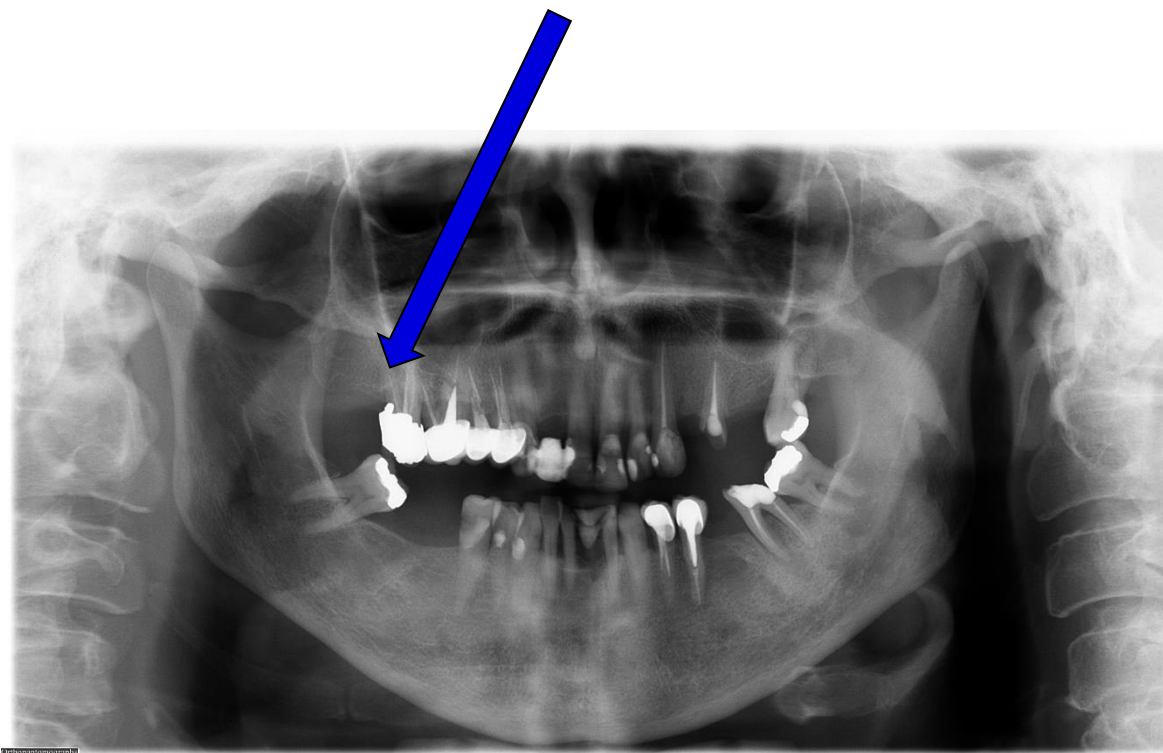
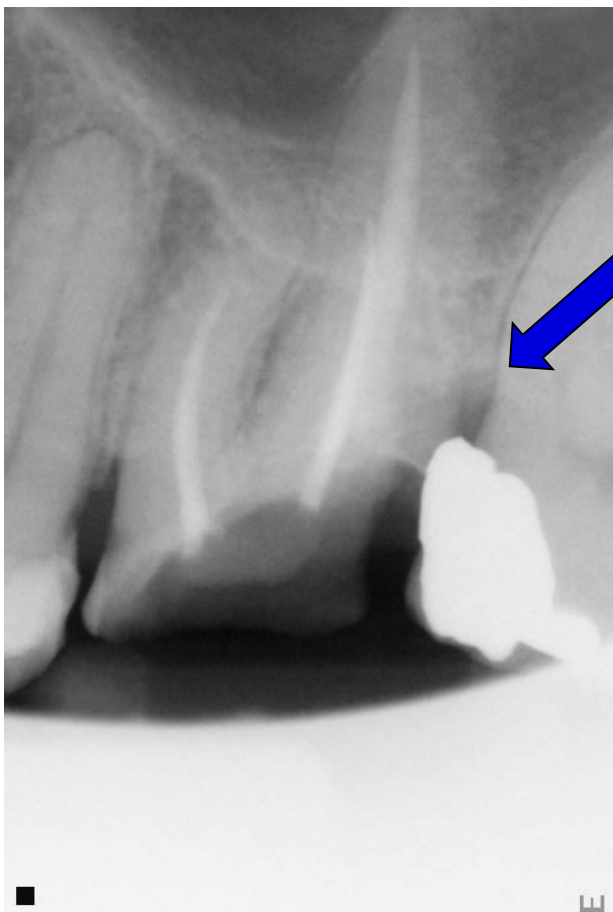
Contact area too narrow



# Clinical consequences of the most common mistakes – the overhang



Retention of food  
Plaque accumulation  
Inflammation  
Bone resorption  
Periodontal pocket  
Mechanic irritation  
*Secondary caries*



10 Definujte zápatí – název prezentace nebo pracoviště

# Clinical consequences of the the other mistakes – trauma

Separation ring

Matrix band

Preparation instruments

Wedges

Necrotizing agent – necrosis of papilla od bone.

# **Restorative dentistry III.**

## **5 th lecture**

### **1. Management of deep caries**

# Deep caries – D4

- Caries pulpae proxima
- Caries ad pulpam penetrans

# Caries pulpae proxima

- Dentine between the caries lesion and dental pulp
- No symptoms
- Indirect pulp therapy: indirect pulp capping  
Calcium hydroxide cement, premanent filling.

# Caries ad pulpam penetrans

- No symptoms
  
- Symtomatic (pulpitis?)

# Caries ad pulpam penetrans

– No symptoms

Vitaliy +:

1. Indirect pulp capping (intermittent excavation)
2. Pulpotomy (aseptic approach, rubber dam)



# Caries ad pulpam penetrans

## – Symptoms

Vitaliy +:

1. Pulpotomy (aseptic approach, rubber dam)

- Partial

- Coronal

- Deep

# Caries ad pulpam penetrans

– No symptoms

Vitality - :

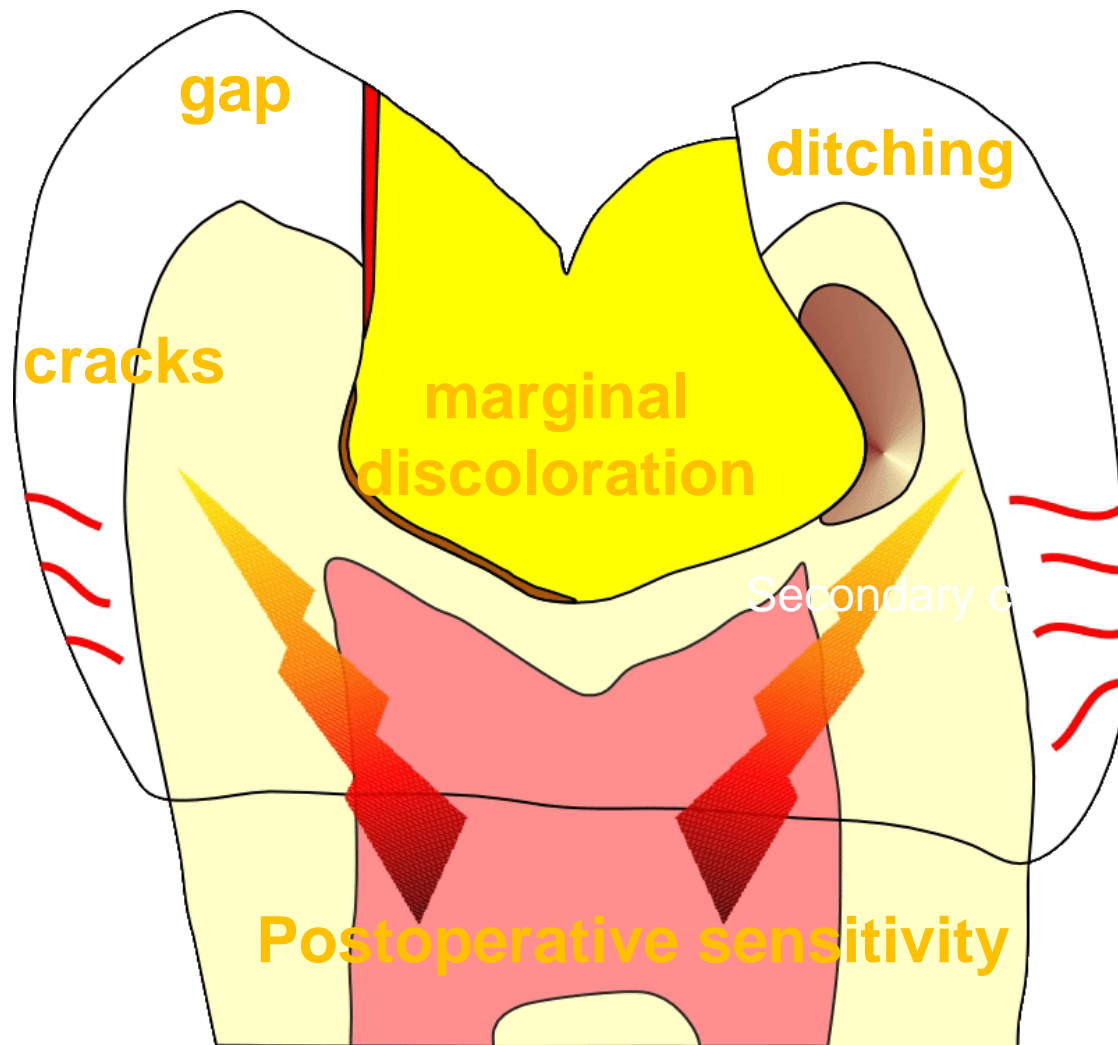
Endodontic treatment

# Postoperative sensitivity

- Pain occurring after the placement of composite restoration
- Studies have reported the frequency of postoperative sensitivity to be low 5% and high 30%

# Postoperative sensitivity - reasons

- Polymerization shrinkage
- Marginal gap
- Suboptimal adhesion
- Inadequate polymerization
- Unfavourable C- factor and residual dentin thickness
- Pre-existing tooth related factors, such as cracks



Versluis 2000

# Postoperative sensitivity - reasons

## – Polymerization shrinkage and polymerization stress

- Gap in dentin
- Cracks in enamel
- Cuspal deflection – enamel crazes or fracture lines

Cracks may increase flexure of tooth structure under occlusal loading or become an avenue for bacterial ingress.

Moreover dentinal fluid in association with the cuspal deflection can potentially induce post op sensitivity depending on the rate and direction of fluid movement.

# Postoperative sensitivity

- The risk and the intensity of postoperative sensitivity is not associated with the filling materials.

(Silorane, bulkfill – no effect)

# Postoperative sensitivity - reasons

## - Marginal gap

Marginal gap is a potential site for bacterial ingress, a portal for fluid exchange leading to the movement of dentinal fluid – post op sensitivity, marginal discoloration, secondary caries



# Postoperative sensitivity - reasons

## – Polymerization shrinkage and polymerization stress

- Gap in dentin
- Cracks in enamel
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Cracks may increase flexure of tooth structure under occlusal loading or become an avenue for bacterial ingress.

Moreover dentinal fluid in association with the cuspal deflection can potentially induce post op sensitivity depending on the rate and direction of fluid movement.

# Postoperative sensitivity - reasons

- Factors affecting the marginal adaptation
- Contamination
- Inadequate bonding application
- C- factor
- Absence of enamel at the restorative margin

# Postoperative sensitivity - reasons

- Factors affecting the marginal adaptation
- Enamel still remains the most favorable substrate for bonding, long term bond longevity in dentine remains questionable due to hydrolytic degradation of the hybrid layer components.

# Postoperative sensitivity - reasons

## - Suboptimal adhesion

A gap forms beneath the restoration and fills with dentinal fluid, sudden movement of dentinal fluid causes pain.

# Postoperative sensitivity - reasons

## - Suboptimal adhesion

The gap formation

- A void in the composite material being placed on the floor of the cavity
- Pulling away of composite from pulpal wall due to shrinkage stress
- Gap in the hybrid layer due to insufficient resin infiltration resulting in formation of hybrid layer.

# Postoperative sensitivity - reasons

## – Suboptimal adhesion

Flowable at the bottom?

Inadequate permeation of the demineralized dentin during the restorative procedure is a significant contributor to postoperative sensitivity.

Selfetching adhesive systems?

No significant association between the bonding strategy with risk

and intensity of postoperative sensitivity.

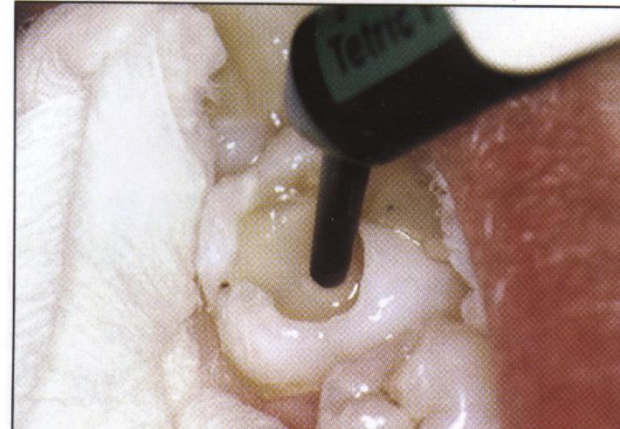
# Postoperative sensitivity - reasons

## – Suboptimal adhesion

No significant association between the bonding strategy with risk and intensity of postoperative sensitivity.

# Flowables - importance

- 1. Excellent marginal adaptation**
- 2. Protection of the adhesive**
- 3. Elastic layer ?**





# Postoperative sensitivity - reasons

## – Inadequate polymerization

Composites are relatively flexible in comparison to the stiffness of tooth enamel (modulus elasticity)

The flexure of composite restorations in relation to the tooth can produce pressure changes in the dentinal tubular fluid and subsequent fluid movement – can provoke pain on chewing.

# Postoperative sensitivity - reasons

- Inadequate polymerization
- When adequate placement – the biting sensitivity is rare but
- If the degree of polymerization of the material is not in the acceptable limits – it leads to soggy bottom phenomenon.

*Bulk fill materials x incremental techniques*

*showed no significant difference in the occurrence of reported post op sensitivity.*

# Postoperative sensitivity - reasons

## – Inadequate polymerization

Biological consequences:

The process of polymerization is not complete in the set material.

25 – 50% of the monomer double bonds remain unreacted and this monomer has the potential to irritate the pulp.

**Adequate polymerization is important!**

# Postoperative sensitivity - reasons

## – Unfavourable C- factor and residual dentin thickness

High C- factor – higher risk of gap formation as well as cracks (see the explanation in the first lecture)

Remaining dentin thickness:

Increased cavity depth and reduced dentine thickness – higher risk of postoperative sensitivity.

Base of GIC?

# Postoperative sensitivity - reasons

- Pre-existing tooth related factors, such as cracks

# Postoperative sensitivity - reasons

- Pre-existing tooth related factors, such as cracks

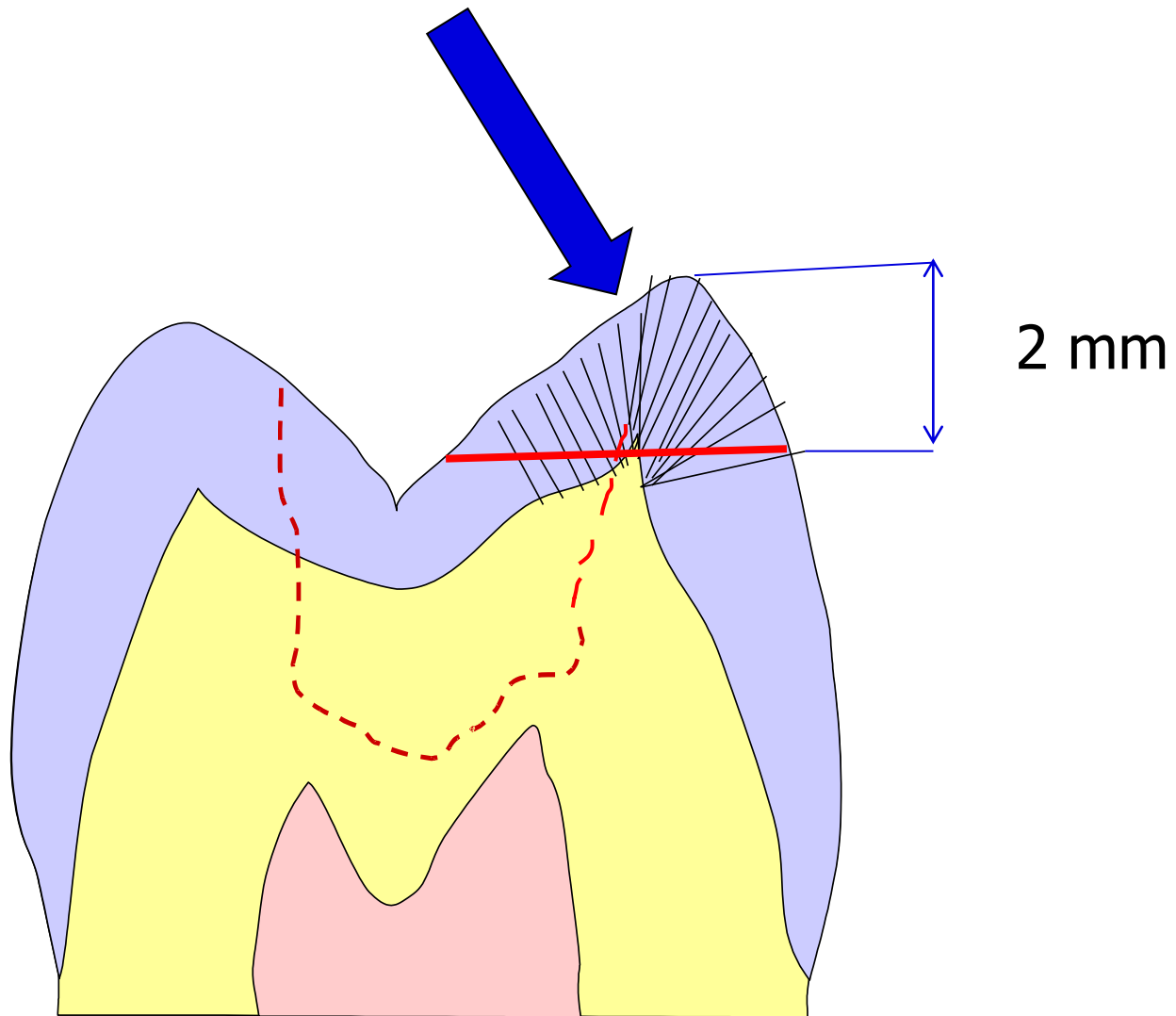
Restoration of a tooth with an unidentified crack can result in symptoms that can be confused with postoperative sensitivity.

# Postoperative sensitivity - reasons

- Pre-existing tooth related factors, such as cracks
- Cracks can develop in the tooth structure due to masticatory insults over the period of time. Cavities with an intercuspal width exceeding one quarter are at increased risk of crack development.
- Consider cuspal coverage!







# Postoperative sensitivity prevention

- Correct indication
- Excellent isolation
- Careful investigation using magnification and illumination
- Proper etching
- Proper drying
- Proper curing

# Postoperative sensitivity strategy

- Perfect investigation
  - Check occlusion
  - Check margins (sealing?)
  - Check tooth structure

If some reason is found: remove it

# Postoperative sensitivity strategy

- If the symptoms are getting worse
- remove the filling, check the tooth structure carefully,
- use calcium hydroxide with the temporary filling material or bioactive materiál (Biodentine),
- Make a new filling.

# **Preparation techniques and their clinical consequences – preparation trauma**

# Preparation

## Power driven

- Rotary
- Alternative

## Hand

- Excavator
- Chisel

# Preparation techniques

- Pressure – max hand preparation – risk of excavators
- Vibrations
- Heat – due to friction
  - increases with rpm (turbine max)

# Consequences in enamel, dentin, cementum

- Rotary preparation with high speed handpiece, turbine:
- Enamel :shattered borders, cracs. Prevention: gentle interrupted preparation, water cooling.
- Dentine: burnt areas, denaturation of protein.
- Dental pulp: aspiration of odontoblasts into dentine tubules, hyperaemia, infiltration, inflammation.

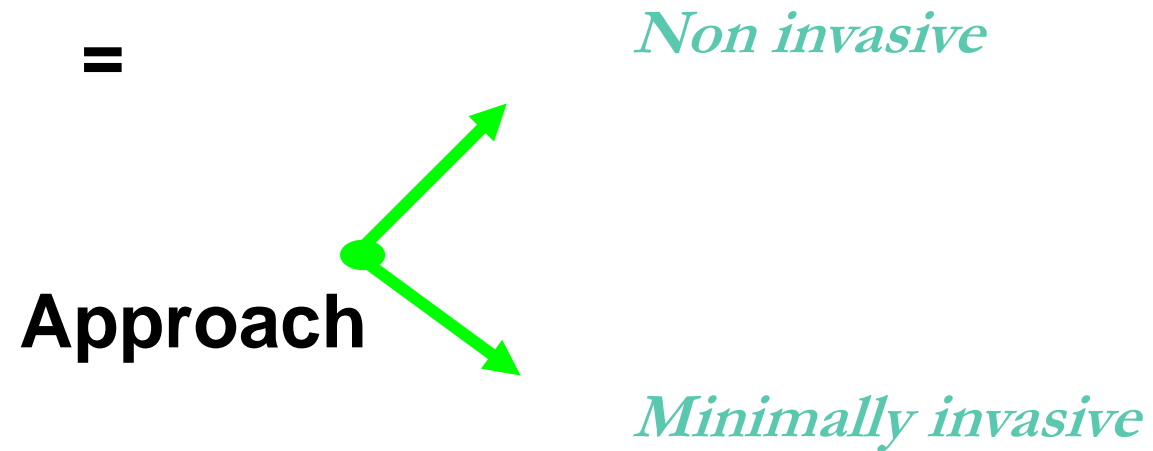


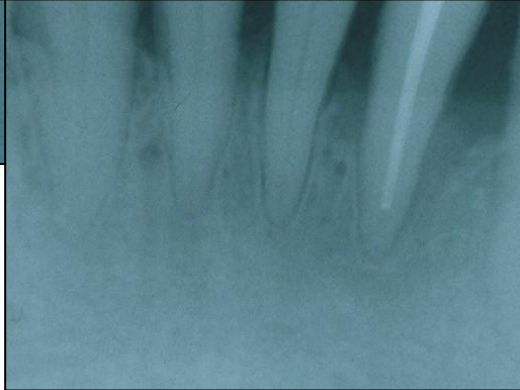
# From extension for prevention to prevention of extension !



# Primum non nocere !

**Minimal intervention**





?



# Prevention od extension



- Etiology and patogenesis of dental caries
- Biomechanical properties of the tooth
- Diagnosis
- Filling materials
- Preparations techniques



**Changes in the treatment concepts,  
size and shape of cavities**



# Biomechanics



MOD - 63%  
Endodontics - 9%  
Dehydratation -14%



*Ferrari M, Scotti R. Fiber posts. Characteristics and clinical applications.  
Milano: Masson,2002.c*



# Illumination, magnification



~~Dry field~~

Clean  
surfaces

Dry field



MUNI  
MED

# Miniinvasive treatment - techniques

- Mechanical
- Chemo – mechanical
- Kinetic
- Laser



# □ Mechanical preparation

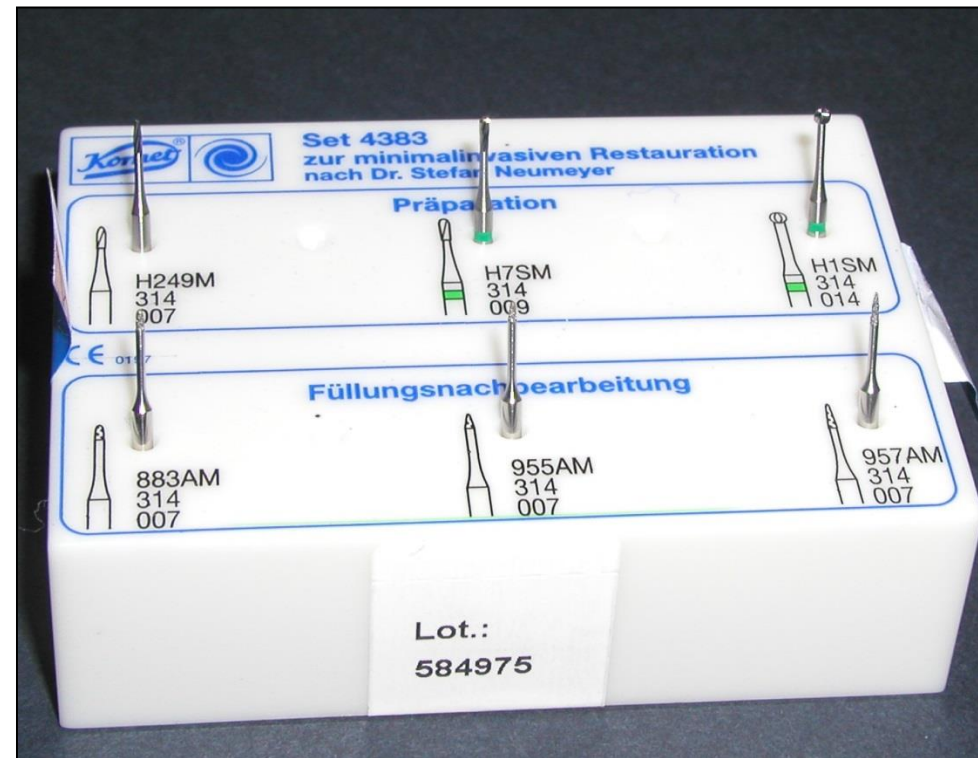
➤ *Rotary*

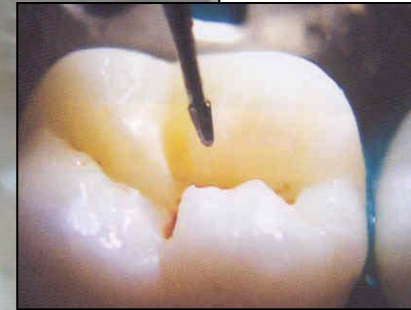
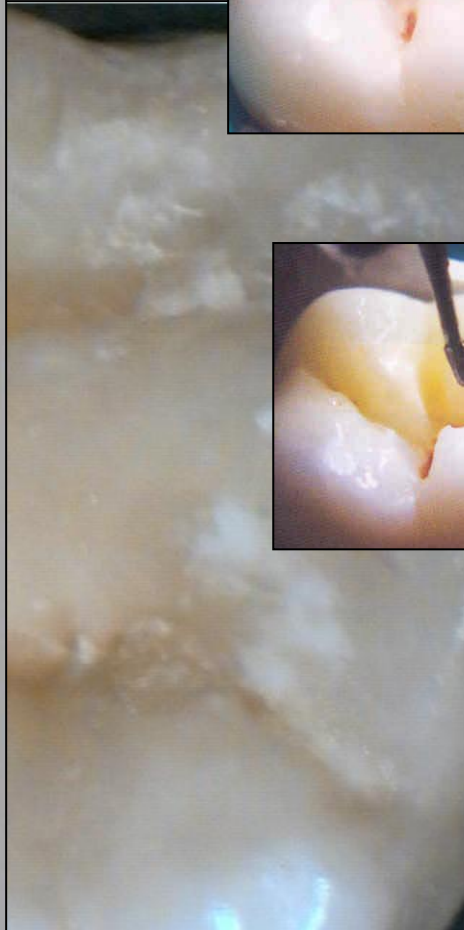
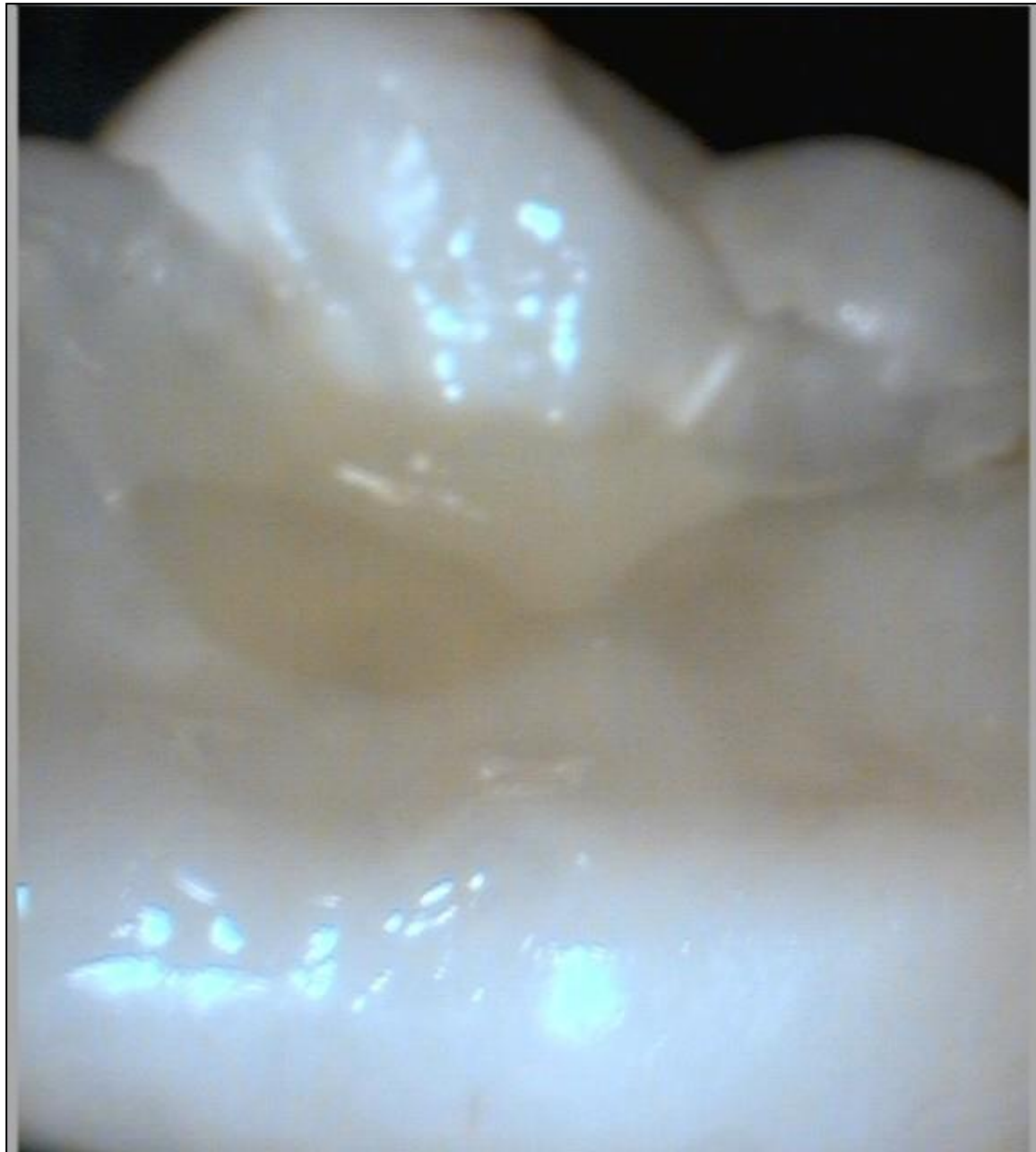
➤ *Sonic , ultrasonic*

➤ *ART*

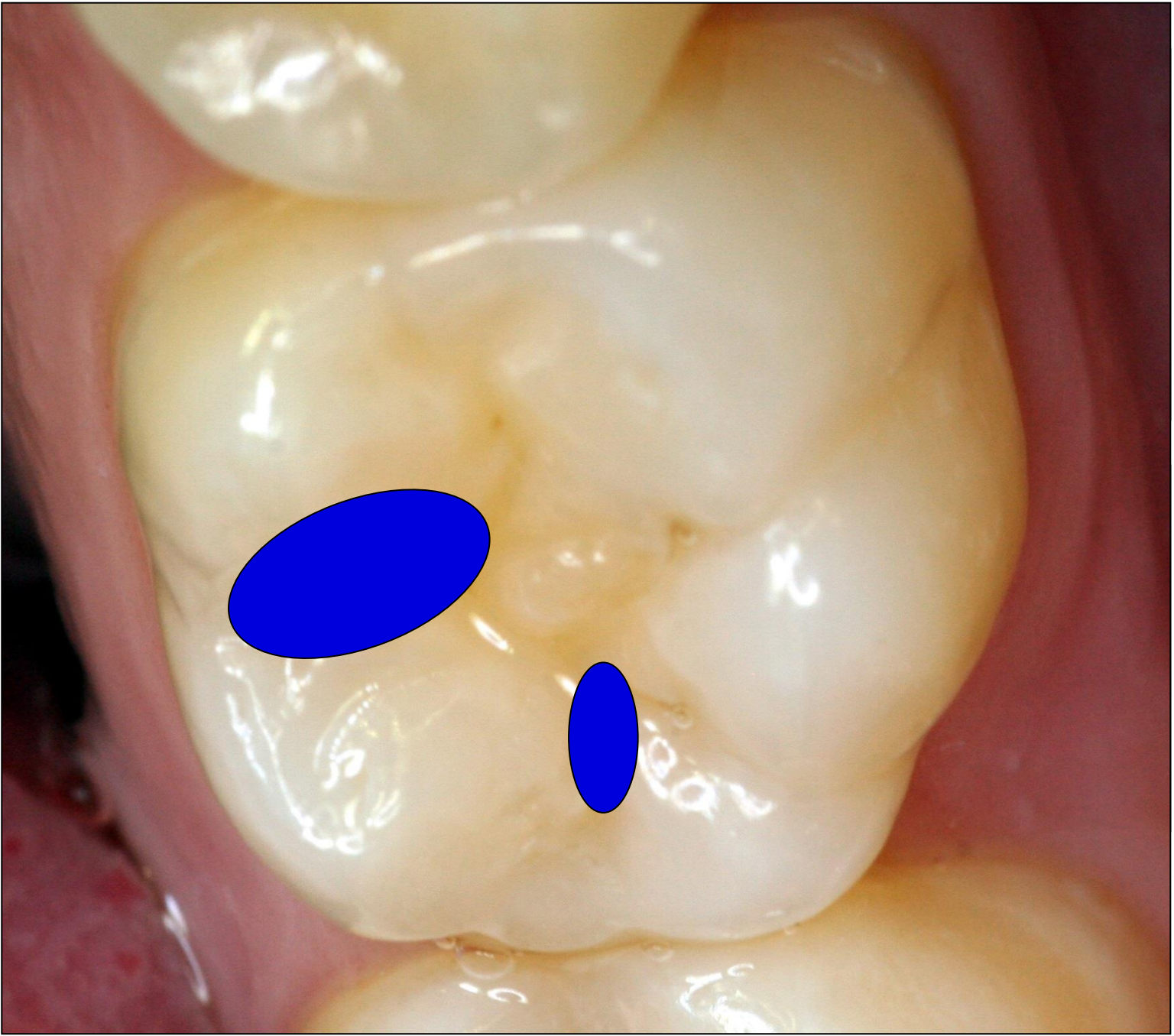


## ➤ Rotary (micro and miniinstruments)

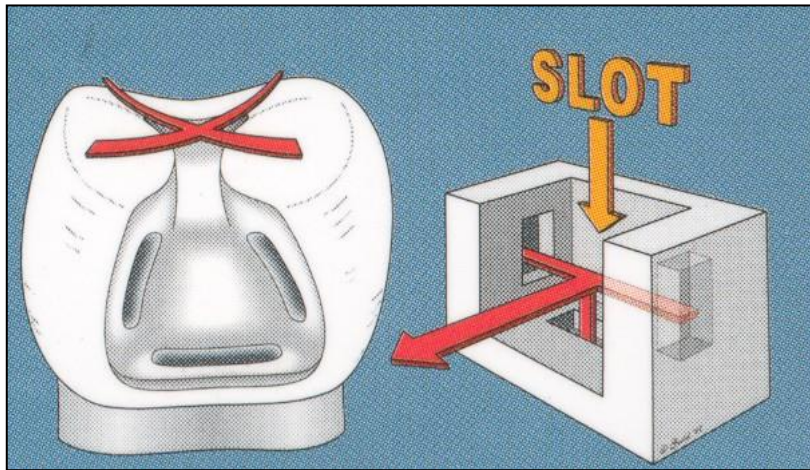




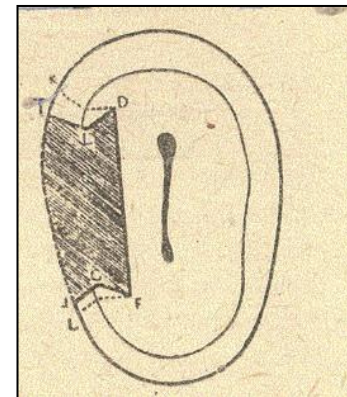
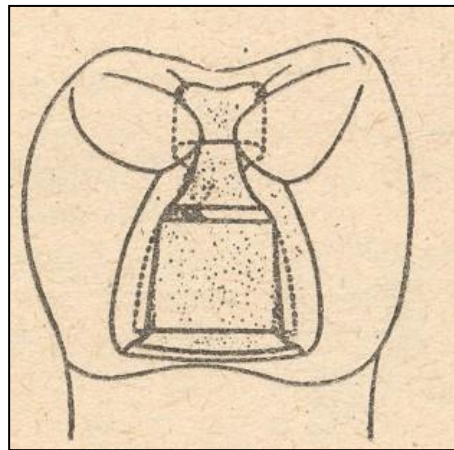




# Slot preparation with macroretention

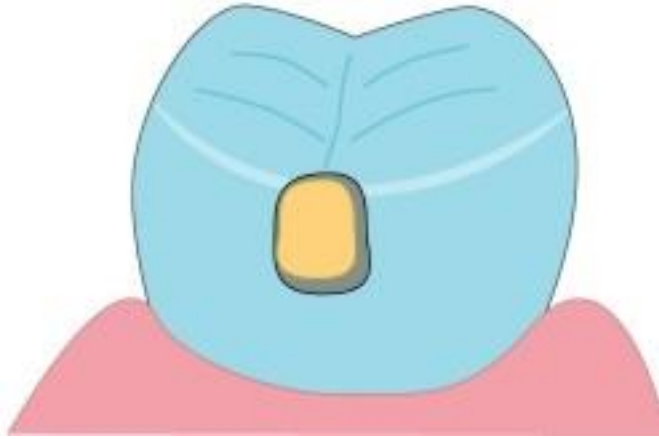


*Sedelmayer J. Amalgám – zapomenuté řemeslo.  
Brno, 2000.*



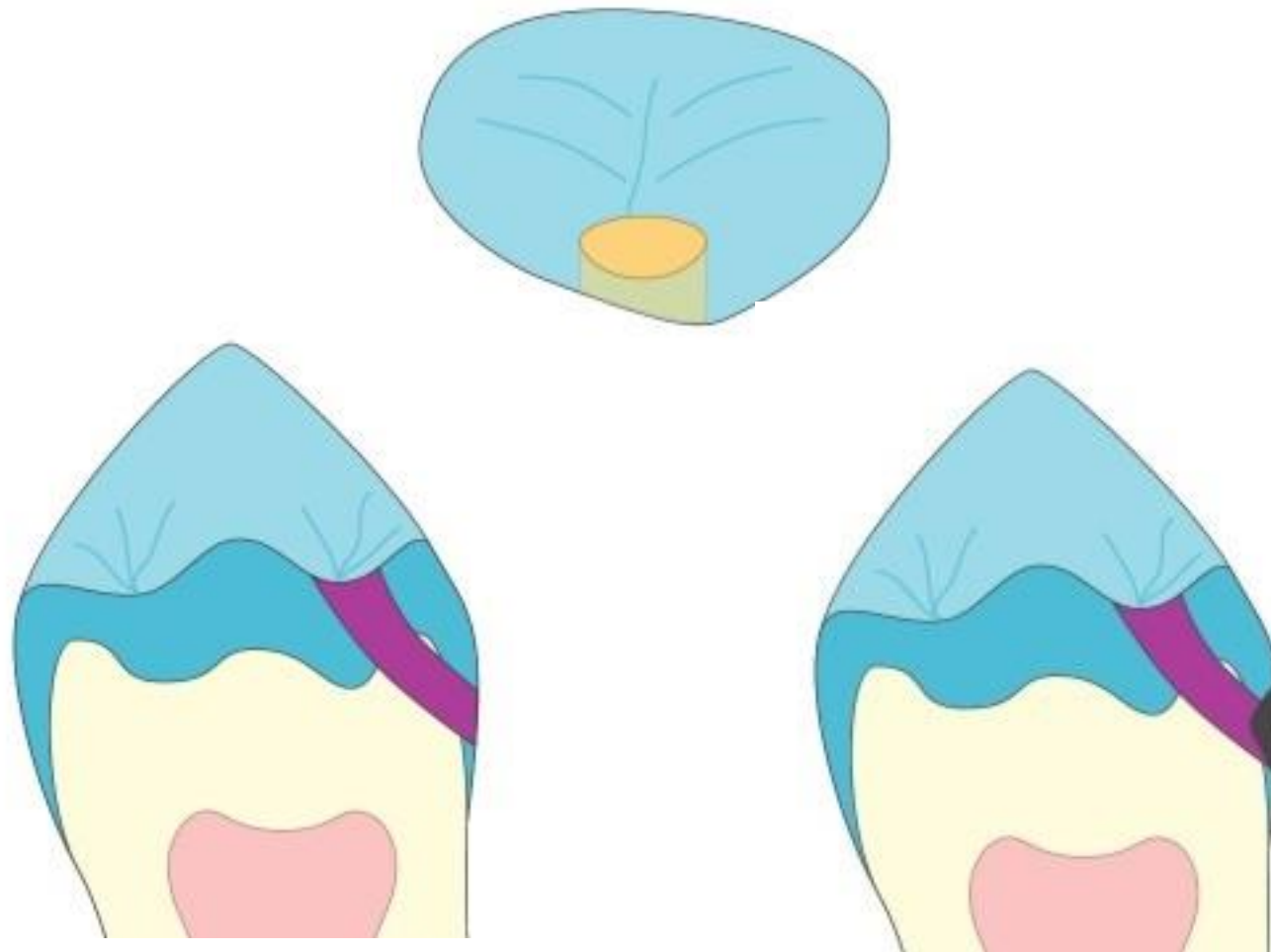
*Bažant V.  
Konservační zubní lékařství, SPN Praha, 1962.*

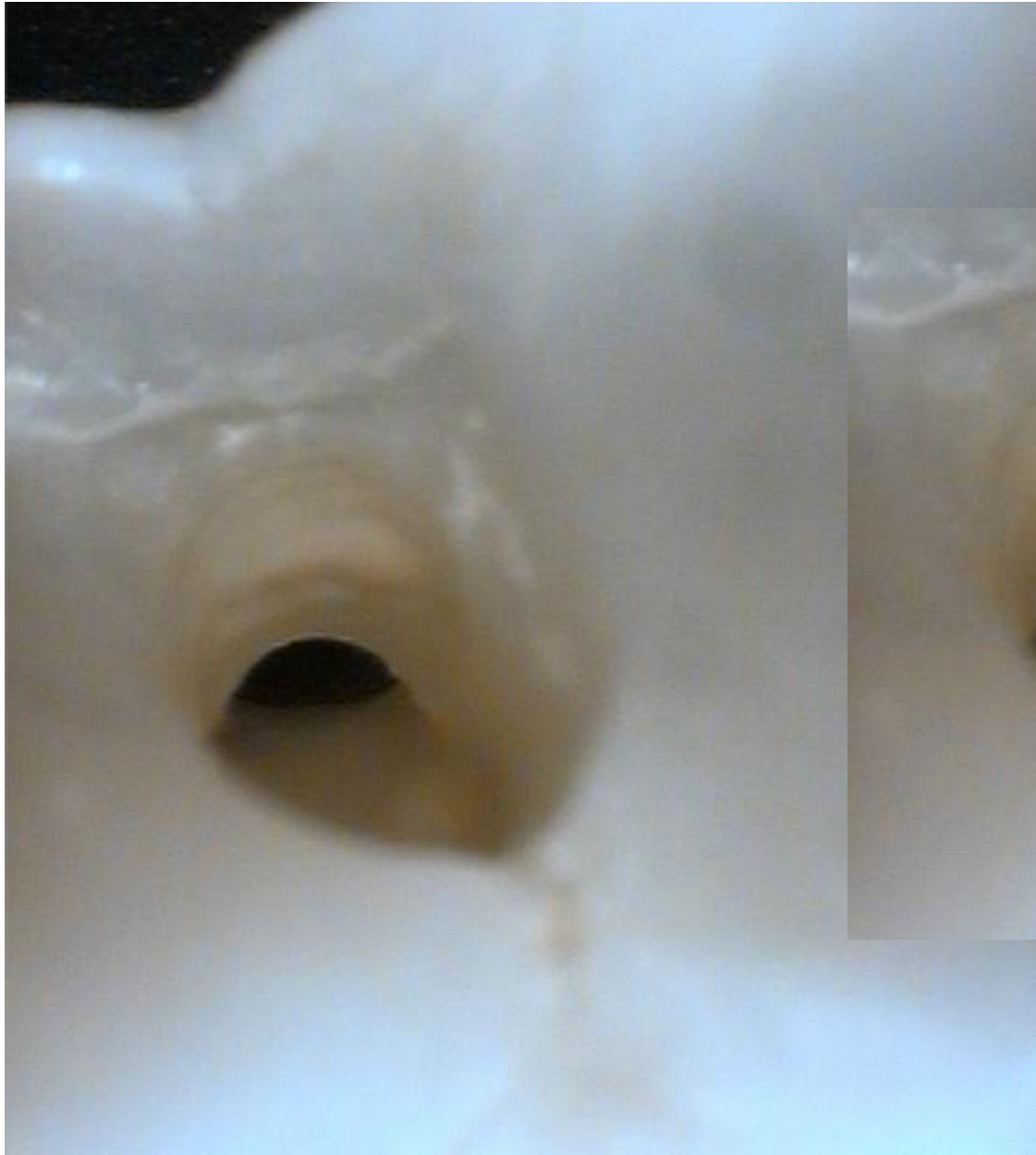
# Adhesive slot

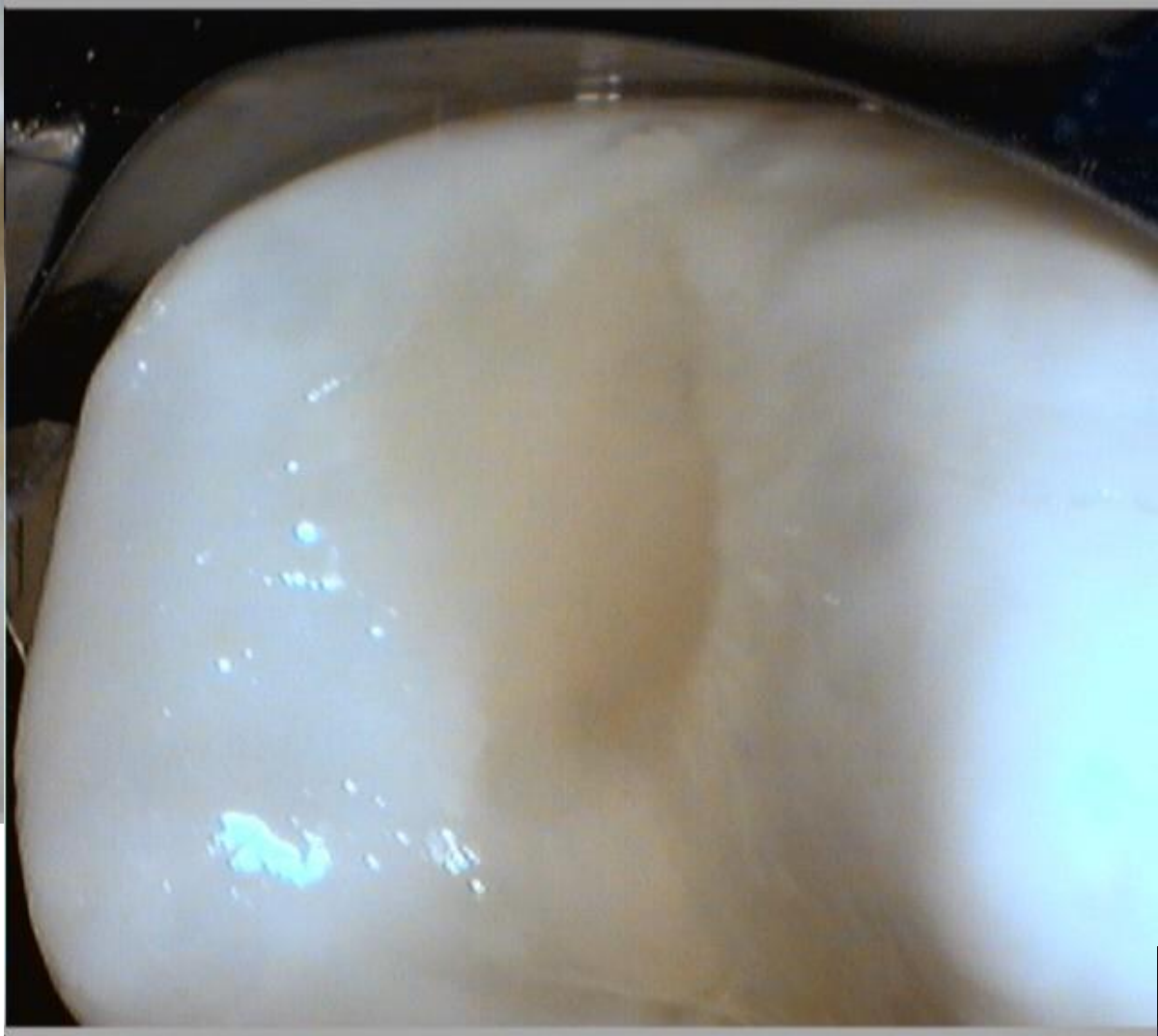




# Tunnel preparation











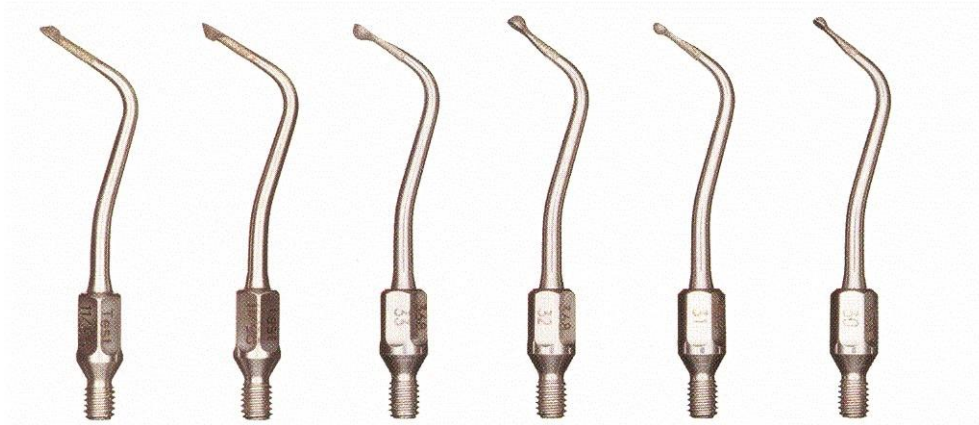
1. Magnification
2. Miniinstruments
3. Disinfection of cavities
4. GIC or composite
5. BW post op

## Success?

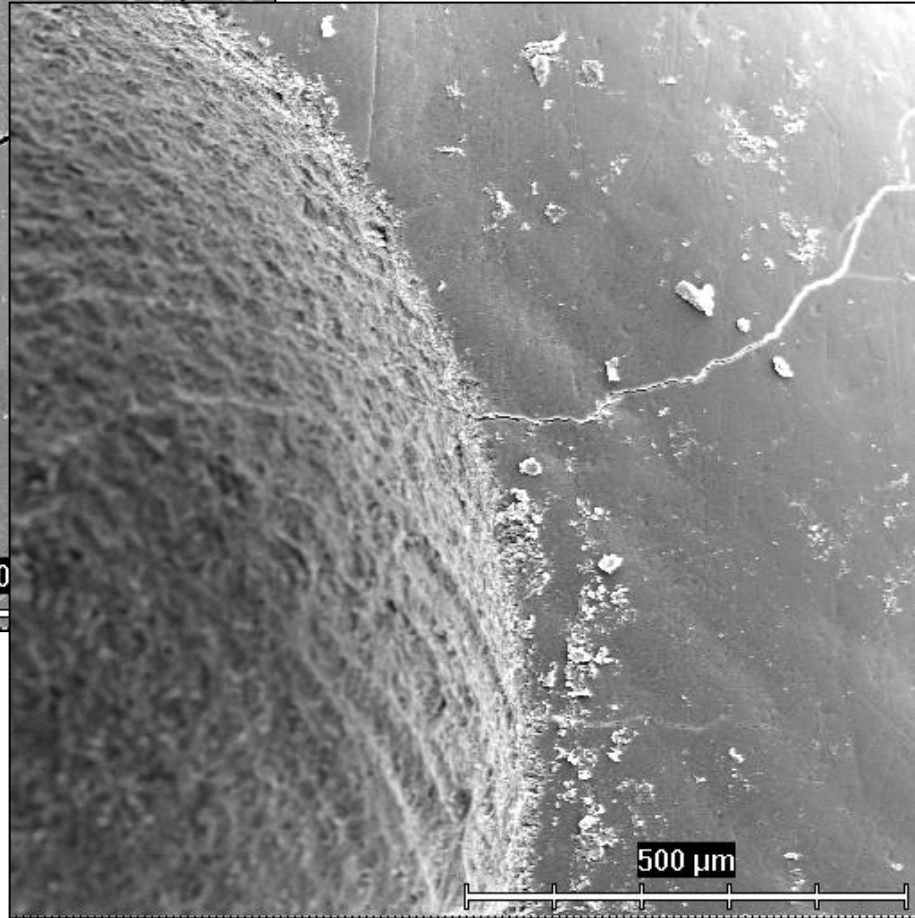
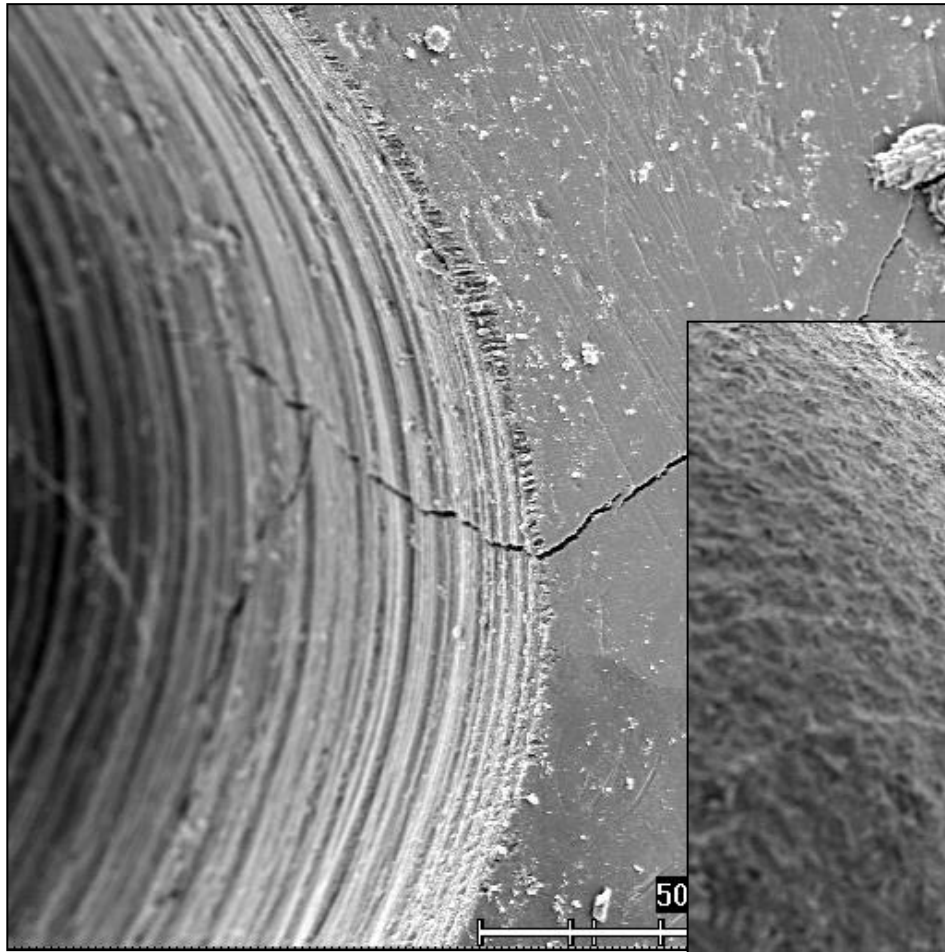
1. Low caries risk
2. Compliance
3. Marginal ridge without infracture
4. D3



## ➤ Sonic and ultrasonic preparation – oscillating instruments







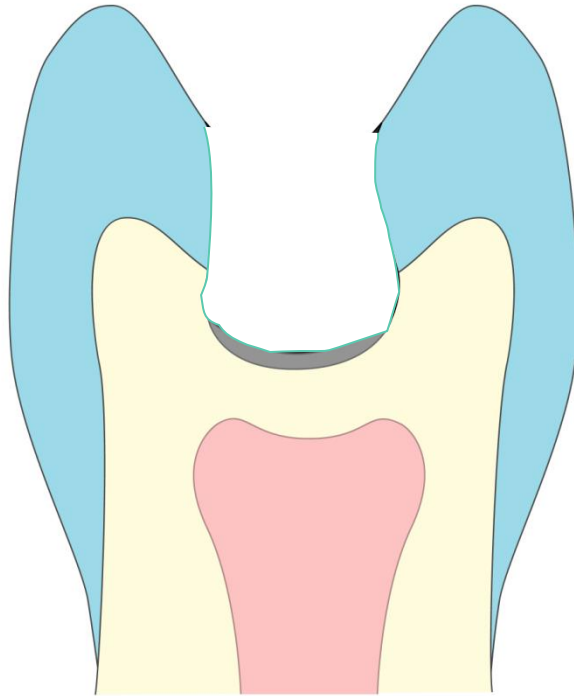


## **Ultrasonic preparation**

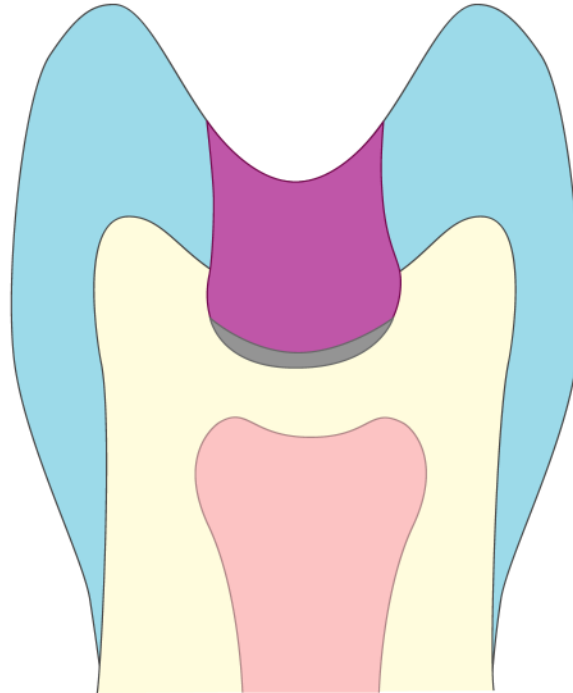
- ✓ *Walls are smoother in comparison to rotary preparation*
- ✓ *Time of the preparation is significant longer*
- ✓ *Exkavation of carious dentin is nor sufficient*
- ✓ *Marginal adaptation of composite filling is significantgly better*



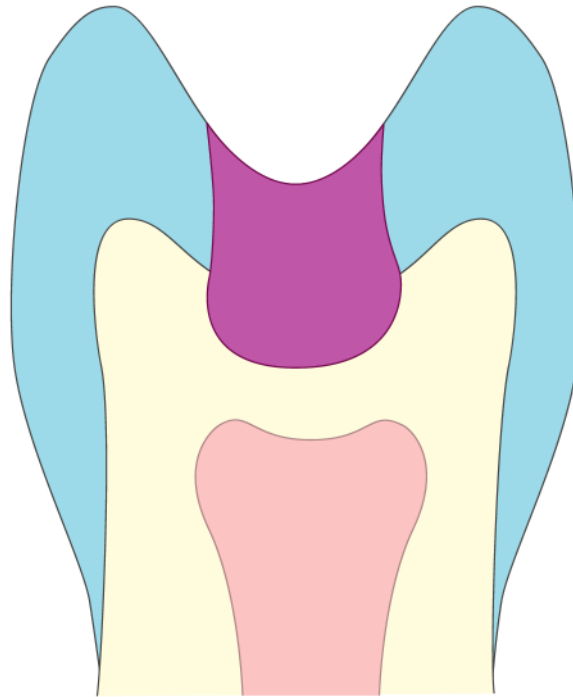
➤ ART



➤ ART



# ➤ ART –atraumatic restorative technique



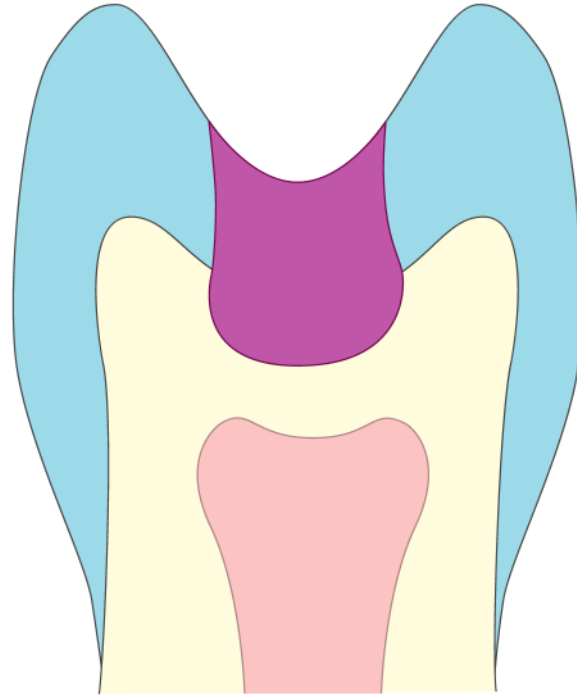
# ART

- ✓ Miniinvasive
- ✓ Remineralization
- ✓ Large lesions
- ✓ Children
- ✓ Disabled patients

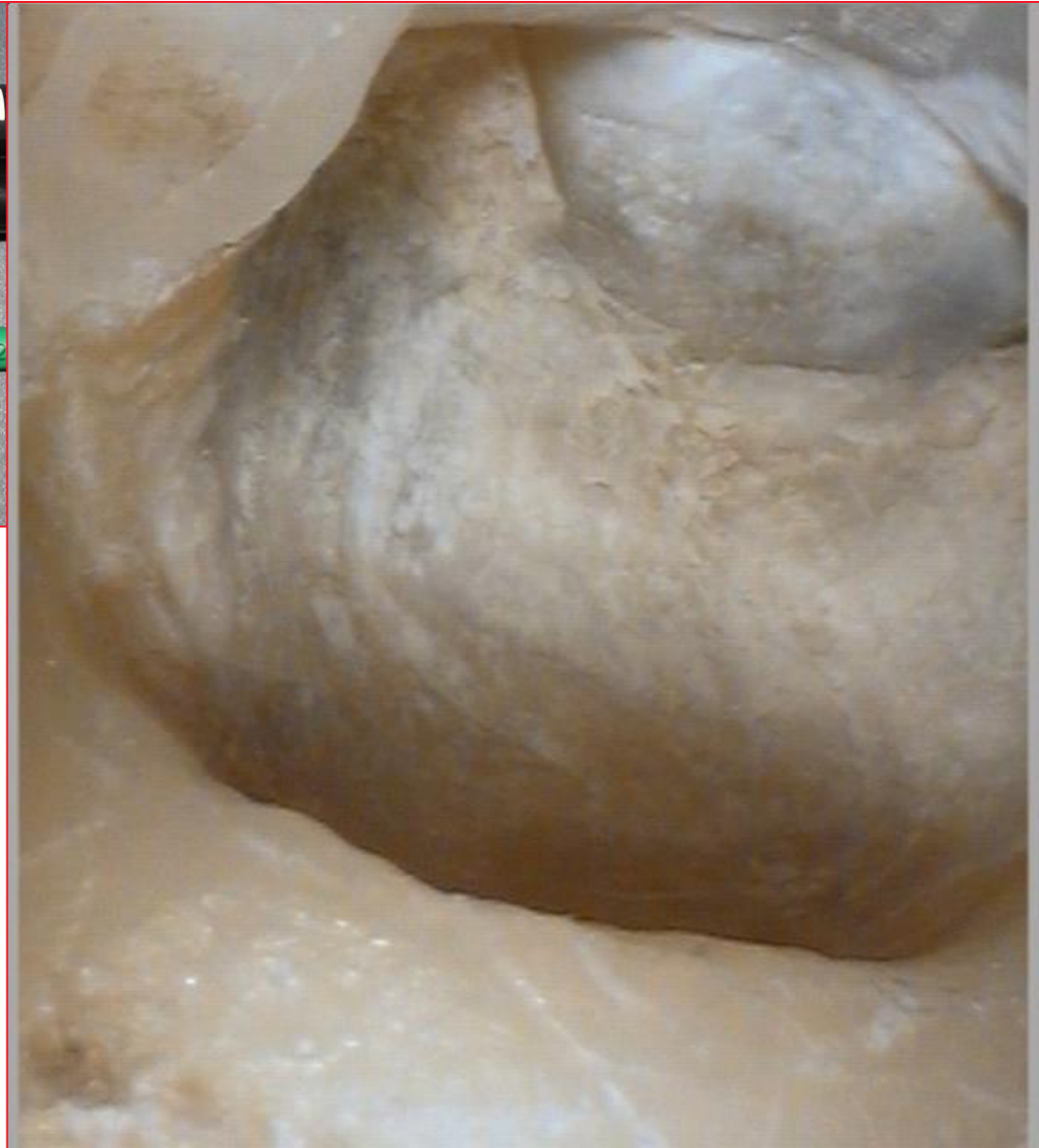




## ➤ Chemomechanical preparation



## ➤ Chemo – mechanical preparation

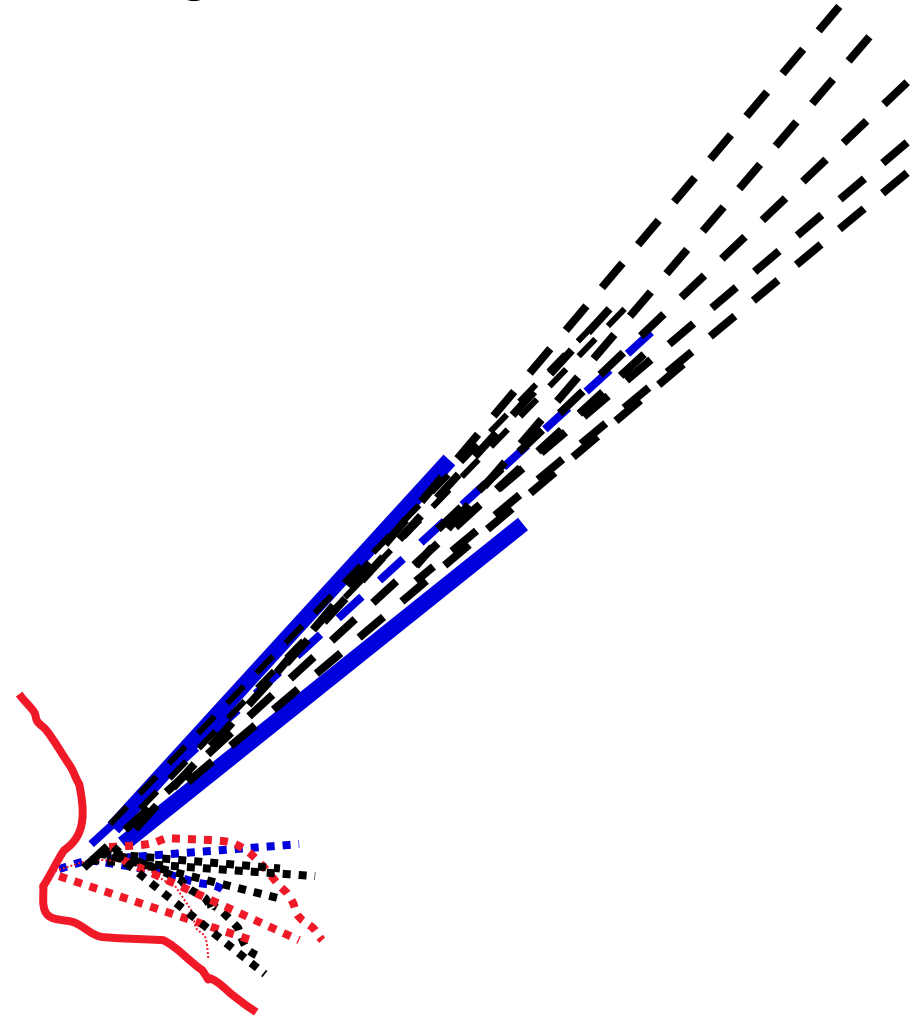


- ✓ **No anesthesia needed**
- ✓ **Smell of chlor**
- ✓ **No noise**
- ✓ **For anxious and disabled patients**
- ✓ **Time consuming**

*Rafique S, Banerjee A, Fiske J.  
Clinical trial of an air-abrasion/Carisolv gel regimen  
for restorative treatment for dentally anxious patients.  
Caries Res 2002; 186 (Suppl.3)36:39.*



➤ Kinetic preparation - sandblasting

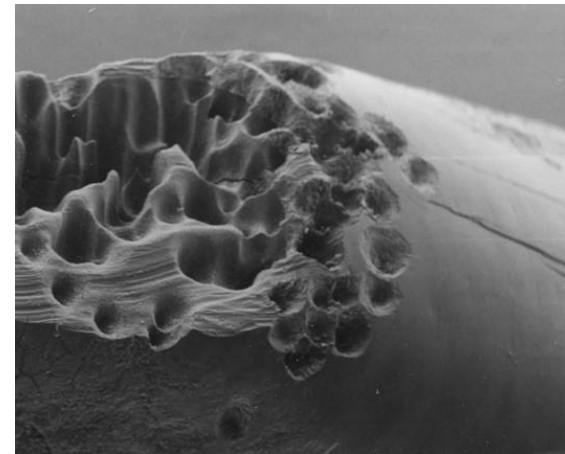


- ✓ ***Good accepted by patients***
- ✓ ***Time consuming***
- ✓ ***Excavation of dentine is not sufficient***
- ✓ ***Rough borders***
- ✓ ***Dust***

*Pietrini DR. Air abrasion for 21st century. Dent Today 2000;19:106-108*



➤ **Laser**



# Er,Cr:YSGG Laser Er: YAG







MUNI  
MED





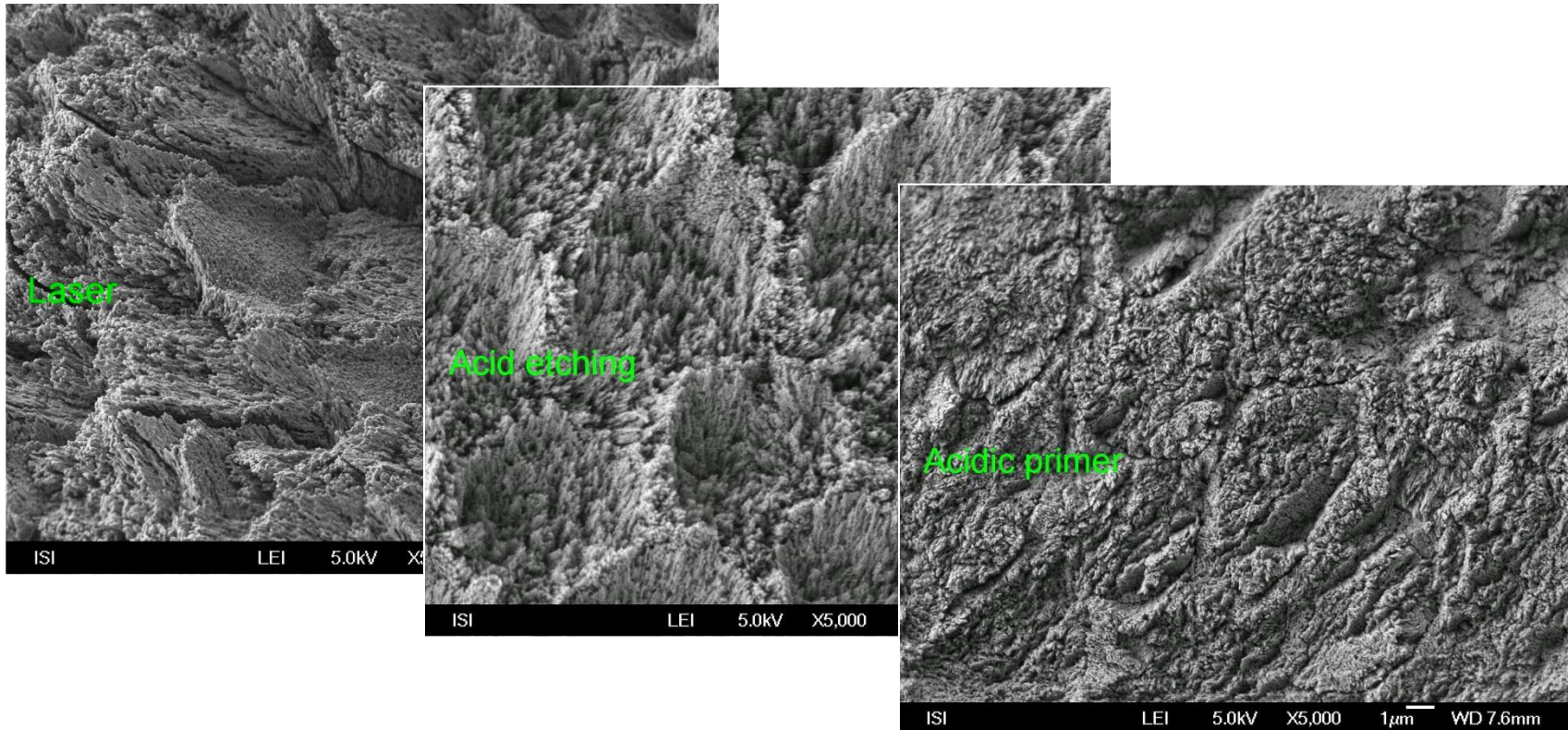
*Roubalíková L, Wilhelm Z, Bilder J. : Use of Er:YAG laser  
in non carious cervical lesions. Clin Oral Invest, v tisku, 2004.*





# Adhesive preparation

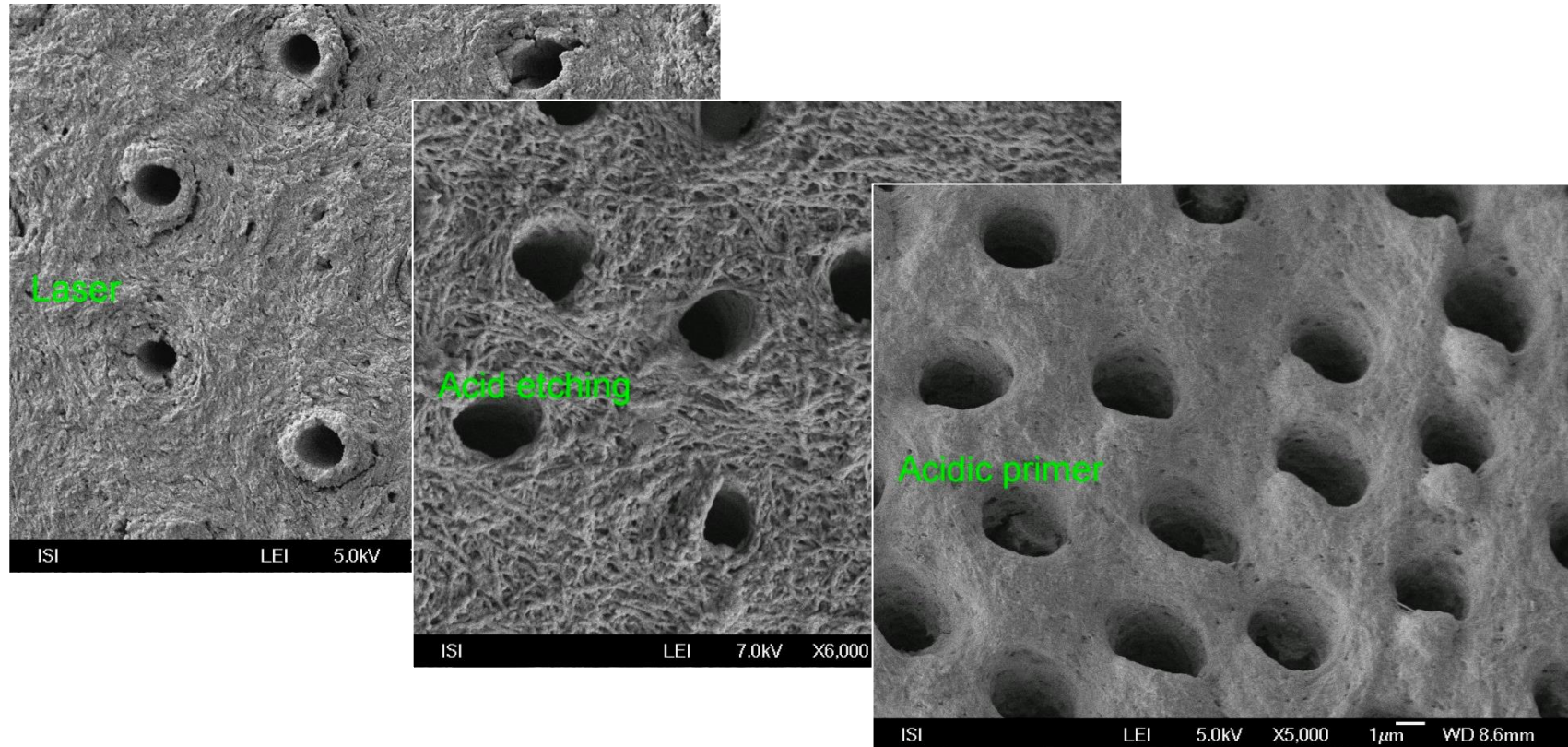
## Sklovina





# Adhesive preparation

## Dentin



- ✓ ***Good accepted***
- ✓ ***Time consuming***
- ✓ ***Antimicrobial effect***
- ✓ ***Risk of perforation of pulp chambre***
- ✓ ***Price***





Děkuji za pozornost

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